Interactive Activity Detection Tools

LA-UR-15-22182

Interactive Activity Detection Tools

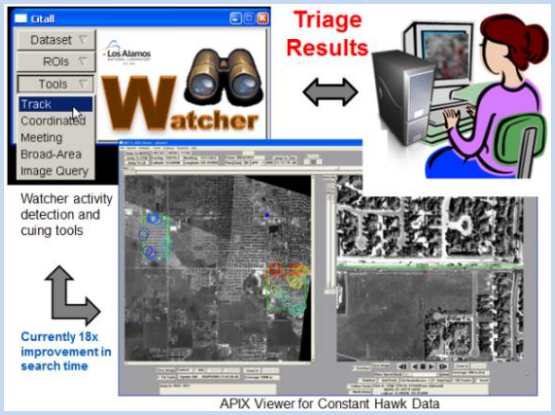
Identifying Meetings, Coordinated Driving Patterns and Anomalies in Wide Area Video

BACKGROUND & MOTIVATION

Video Data *Semantic Network*

Tools for detecting specified activities in video data provide a key intelligence capability. High numbers of false alarms, however, reduce tool effectiveness and analyst patience.

INNOVATION

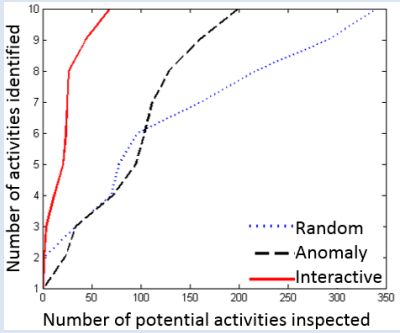


User feedback reduces false alarms

- This project will reduce the number of false alarms generated by activity detection tools (including single vehicle start / stop, multi-vehicle meetings and coordinated driving patterns) by exploiting user feedback in a new way.

DESCRIPTION

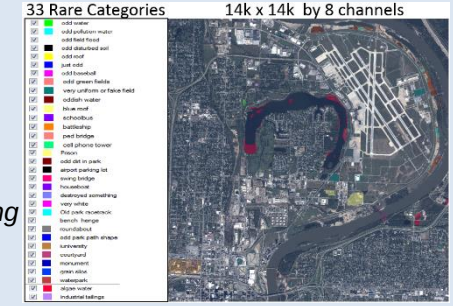
Rare Category Detection (RCD) maximizes the information exchange between user and machine during triage.



Optimizing for the user-in-the-loop means RCD (interactive) can reduce the amount of data the analyst has to inspect by an order of magnitude compared to traditional anomaly based activity detection tools (anomaly) [1].

RCD technology is not specific to Los Alamos activity detection tools and could be applied to any application that involves users interacting with tools via triage.

Broad area search of multi-spectral satellite imagery also benefits from RCD by focusing the search on new content categories instead of rediscovering categories the analyst has already seen.



[1] Porter, R., D. Hush, and A. Fraser, Narrowing the Semantic Gap in Wide Area Motion Imagery. IEEE Signal Processing Magazine, 2010. 27(5): p. 56-65.

TRL 5 – Activity Detection Tools

- Various activity detection tools have been developed for wide-area motion imagery and have been installed in several analyst environments.

TRL 3 – RCD

- LANL internal R&D funding is supporting RCD development from Level 1 to Level 3.

ANTICIPATED IMPACT

Current: An independent analyst used our activity detection tools to detect 50% of the ground truth activities within 90 minutes – a 18x reduction in search time compared to an unassisted analyst.

Future: RCD will enable a further 10x reduction in search time by reducing the number of false alarms – this estimate is based on the experiments shown to the left.

PATH FORWARD

Current Phase – LDRD:

- Develop theory and algorithms for RCD approach.

Phase 2A – Wide Area Motion Imagery:

- Integrate RCD into LANL activity detection tools for wide-area motion imagery analysis.

Phase 2B – RCD in Triage Applications:

- Integrate RCD with third-party tools in wide area motion imagery, full motion video, change detection in temporal image stacks, image databases and other content-based search applications

Potential End Users: Analysts who spend too much time annotating and analyzing unstructured data such as image and video.

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